

We claim:

1. A device for the detection of ligands comprising:
  - at least one substrate;
  - 5 at least one receptor attached to said substrate, wherein said at least one receptor is capable of binding to a ligand to form a receptor-ligand complex and wherein the formation of said receptor-ligand complex produces a signal; and
  - an amplification mechanism interfaced with said receptor comprising
  - 10 a liquid crystalline material, wherein said amplification mechanism amplifies said signal upon receptor-ligand complex formation.
2. The device of claim 1, wherein said at least one receptor is attached to the surface of said substrate.
- 15 3. The device of claim 2, wherein said at least one receptor is attached to at least one of (i) the surface of said substrate and (ii) the pores of a porous substrate.
4. The device of claim 3, wherein a plurality of receptors are attached to and
- 20 randomly distributed on the surface and within the pores of said porous substantially spherical substrate.
5. The device of claim 1, wherein the liquid crystalline material is selected from the group consisting of thermotropic liquid crystalline material and lyotropic
- 25 liquid crystalline material.
6. The device of claim 5, wherein the liquid crystalline material is a lyotropic liquid crystalline material.
- 30 7. The device of claim 6, wherein the lyotropic liquid crystalline material is a lyotropic chromonic liquid crystalline material.

8. The device of claim 5, wherein the liquid crystalline material is a thermotropic liquid crystalline material.
9. The device of claim 1, wherein the substrate is made from a material selected from the group consisting of polymeric and inorganic materials.
10. The device of claim 9, wherein the polymeric materials are selected from the group consisting of polyions, polyalkenes, polyacrylates, polymethacrylates, polyvinyls, polystyrenes, polycarbonates, polyesters, polyurethanes, polyamides, polyimides, polysulfones, polysiloxanes, polysilanes, polyethers, and polycarboxylates.
11. The device of claim 10, wherein the polymeric material is a polystyrene.
12. The device of claim 9, wherein the substantially spherical substrate is made from an inorganic material.
13. The device of claim 12, where the inorganic material is selected from the group consisting of glass, silicon, and colloidal gold.
14. The device of claim 13, wherein the inorganic material is glass.
15. The device of claim 1, wherein said at least one receptor is attached to said substrate by at least one means selected from the group consisting of (i) chemical attachment and (ii) physical attachment.
16. The device of claim 15, wherein said chemical attachment is covalent bonding.
17. The method of claim 15, wherein said physical attachment is selected from the group consisting hydrophobic interactions and van der Waals interactions.

18. A method for detecting ligands comprising:

providing a device for detecting ligands, said device comprising at least one substantially spherical substrate; at least one receptor attached to said spherical substrate, wherein said at least one receptor is capable of binding to a ligand to form a receptor-ligand complex and wherein the formation of said receptor-ligand complex produces a signal; and an amplification mechanism interfaced with said receptor comprising a liquid crystalline material, wherein said amplification mechanism amplifies said signal upon receptor-ligand complex formation;

exposing a sample containing at least one ligand to said at least one substrate;

allowing said receptor to interact with said at least one ligand to form at least one receptor-ligand complex, thereby producing a signal;

amplifying the signal with the amplification mechanism;

and measuring the amplified signal produced by said receptor-ligand complex formation.

19. A device for the detection of ligands comprising:

at least one substantially spherical substrate coated with a receptor-binding material;

at least one receptor attached to said coated spherical substrate, wherein said at least one receptor is capable of binding to a ligand to form a receptor-ligand complex and wherein the formation of said receptor-ligand complex produces a signal; and

an amplification mechanism interfaced with said receptor comprising a liquid crystalline material, wherein said amplification mechanism amplifies said signal upon receptor-ligand complex formation.